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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/682,443	09/04/2001	Michiel Jacques van Nieuwstadt	200-1758 JDR	9487

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FORD GLOBAL TECHNOLOGIES, LLC.
SUITE 600 - PARKLANE TOWERS EAST
ONE PARKLANE BLVD.
DEARBORN, MI 48126

EXAMINER	
NGUYEN, TU MINH	

ART UNIT	PAPER NUMBER
3748	

DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/682,443	VAN NIEUWSTADT, MICHIEL JACQUES	
	Examiner	Art Unit	
	Tu M. Nguyen	3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 4-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 4-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. An Applicant's Amendment filed on August 7, 2004 has been entered. Claims 20-21 have been added. Overall, claims 1 and 4-21 are pending in this application.

Drawings

2. The formal drawing of Figure 2 filed on September 24, 2003 has been approved for entry.

Specification

3. The disclosure is objected to because on page 4, paragraph 0014, the sentence is incomplete. According to PTO's record, paragraph 0014 reads "FIG. 2 is a functional block diagram of an engine exhaust system according to the", which is clearly an incomplete sentence. Appropriate correction is required.

Claim Objections

4. Claim 21 is objected to because

- On line 7 of the claim, "thetemperature" should read --the temperature--.

- On the last line of the claim, "again" should read --aging--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 4, 12, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Bagley et al. (U.S. Patent 5,497,617).

Re claim 1, as illustrated in Figure 2 and indicated in claims 1-2, Bagley et al. disclose a method for controlling hydrocarbon (methanol) injection into an engine exhaust to reduce NOx, comprising injecting the hydrocarbon into the engine exhaust in accordance with detection of a light-off event, such light-off event being detected when there is a hydrocarbon-oxygen reaction wherein an exothermic reaction is produced and detected (Figure 2 shows that a mixture of methanol and air has an ignition temperature at a catalyst temperature as low as 50°C and thus, exhibits an exotherm as shown; as claimed in claims 1-2, Bagley et al. utilize a heater to raise a catalyst temperature to an ignition temperature of a mixture of methanol and air; they then supply the mixture of methanol and air into the catalyst, resulting in the combustion of said mixture and raising the catalyst temperature until the catalyst reaches light-off temperatures for other components (NOx, HC, CO) in the exhaust gas).

Re claims 4, 12, and 20, as illustrated in Figure 2 and indicated in claims 1-2, Bagley et al. disclose a method for controlling hydrocarbon (methanol) injection into an engine exhaust to

reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst for reaction therein, comprising:

(a) detecting an exothermic reaction across the catalyst (step b) in claim 1; also see Figure 2 where an exotherm for methanol is detected when a catalyst temperature reaches approximately 50°C);

(b) detecting, measuring, or obtaining a temperature of the catalyst in response to the detected exothermic reaction (from Figure 2, a catalyst temperature of about 45°C is determined when an exotherm for methanol is detected); and

(c) injecting the hydrocarbon into the reaction in accordance with the measured temperature (step c) in claim 1).

7. Claims 4-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Hirota et al. (U.S. Patent 5,201,802).

Re claims 4, 12, 14, and 20, as shown in Figures 6 and 14, Hirota et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, comprising:

(a) detecting an exothermic reaction across the catalyst (step 608);

(b) detecting, measuring, or obtaining a temperature of an inlet of the catalyst in response to the detected exothermic reaction (step 608) (an inlet temperature t1 is detected and measured using an upstream temperature sensor (24)); and

(c) injecting the hydrocarbon into the reaction in accordance with the measured temperature (steps 618 and 620).

Re claims 5, 6, 10, 13, 15, 16, and 19, as illustrated in Figures 6 and 14-18, Hirota et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, comprising:

(a) detecting a pair (t1 and t2) of temperatures across the catalyst to provide a temperature difference (Δt) indicating an exothermic reaction across the catalyst (step 608);

(b) comparing the temperature difference with a predetermined temperature threshold (ΔTi) (step 610);

(c) determining an exothermic condition temperature (T1) when the temperature difference is determined to exceed the threshold (step 614, Figure 17), such exothermic condition temperature being determined from an upstream one of the detected temperatures;

(d) comparing the determined exothermic condition temperature with an exothermic condition temperature (550 in Figure 17) expected from the catalyst at a time prior to the determined exothermic condition temperature; and

(e) modifying the injected hydrocarbon in accordance with the last-mentioned comparison (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10) (Hirota et al. determine in advance a desired lower limit catalyst inlet temperature T1 and a desired upper limit catalyst outlet temperature T2 for the optimum reduction of NOx as a function of the degradation extent DR (Figure 17). For a non-deteriorated catalyst, T1 and T2 equal 450 and 550, respectively. If a detected temperature difference (Δt) across the catalyst is different from a predetermined temperature threshold (ΔTi), a degradation extent DR is

calculated (step 612); and a set of desired temperature values T1 and T2 are determined based on the calculated DR (step 614). A hydrocarbon concentration H1 is also determined based on DR).

Re claim 21, as shown in Figures 6 and 14-18, Hirota et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst for reaction therein, comprising:

(a) identifying catalyst light-off by detecting production of an exothermic reaction across the catalyst when a temperature difference (Δt) across the catalyst exceeds a threshold value (ΔTi) (steps 608 and 610);

(b) determining a light-off temperature (T1) of the catalyst by measuring the temperature at which the exothermic reaction is detected (step 614, Figure 17);

(c) obtaining a measure (DR) of catalyst aging based on the detected temperature (step 612); and

(d) adjusting injection of the hydrocarbon into the reaction in accordance with the measure of catalyst aging (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10) (Hirota et al. determine in advance a desired lower limit catalyst inlet temperature T1 and a desired upper limit catalyst outlet temperature T2 for the optimum reduction of NOx as a function of the degradation extent DR (Figure 17). For a non-deteriorated catalyst, T1 and T2 equal 450 and 550, respectively. If a detected temperature difference (Δt) across the catalyst is different from a predetermined temperature threshold (ΔTi), a degradation extent DR is calculated (step 612); and a set of desired temperature values T1 and T2 are

determined based on the calculated DR (step 614). A hydrocarbon concentration H1 is also determined based on DR).

Re claims 7, 9, 17, and 18, as shown in Figures 6 and 14-18, Hirota et al. disclose a system and a processor (10) for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, the system comprising:

(a) a catalyst (6) for facilitating a reaction between the injected hydrocarbon and NOx in the exhaust;

(b) a hydrocarbon injector (14) for injecting the hydrocarbon into the exhaust upstream of the catalyst;

(c) a detecting system comprising:

- a pair of sensors (24, 20) each detecting a common parameter in the exhaust, one of such sensors being upstream of the catalyst and the other one of the sensors being downstream of the first sensor; and

- a processor (10) for controlling the hydrocarbon injector in response to the pair of sensors, such processor being programmed to:

- comparing a difference (Δt) in the common parameter detected by the pair of sensors with a predetermined temperature threshold (ΔTi) (step 610);

- determining an exothermic condition temperature (T1) from an upstream sensor (24) when the difference in the common parameter is determined to exceed the threshold (step 614, Figure 17);

- comparing the determined exothermic condition temperature with an exothermic condition (550 in Figure 17) expected from the catalyst at a time prior to the determined exothermic condition; and

- modifying the injected hydrocarbon in accordance with the last-mentioned comparison (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10) (Hirota et al. determine in advance a desired lower limit catalyst inlet temperature T1 and a desired upper limit catalyst outlet temperature T2 for the optimum reduction of NOx as a function of the degradation extent DR (Figure 17). For a non-deteriorated catalyst, T1 and T2 equal 450 and 550, respectively. If a detected temperature difference (Δt) across the catalyst is different from a predetermined temperature threshold (ΔTi), a degradation extent DR is calculated (step 612); and a set of desired temperature values T1 and T2 are determined based on the calculated DR (step 614). A hydrocarbon concentration H1 is also determined based on DR).

Re claims 8 and 11, in the system and method of Hirota et al., the common parameter is temperature and wherein the sensors are temperature sensors.

Response to Arguments

8. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are not persuasive.

Re claims 1, 4, 12, and 20, in response to applicant's argument that Bagley et al. fail to detect an exothermic reaction across the catalyst (page 10 of Applicant's Amendment), the examiner respectfully disagrees.

Step (b) in claim 1 in Bagley et al. reads "*applying sufficient energy to the electrically heated catalyst to attain the conversion temperature or ignition of the air/fuel mixture*;". This sentence means that Bagley et al. will turn off or reduce the electricity to the electrically heated catalyst when the conversion temperature or ignition of the air/fuel mixture is observed or detected (Also see steps (d) and (e) in claim 14). Figure 2 in Bagley et al. exhibits the exotherm in a catalyst for three different fuels: methanol, ethanol, and hexane. Based on this figure, Bagley et al. are able to determine that the conversion temperature for the catalyst they are testing is at about 45°C for methanol, 50-60°C for ethanol, and about 160 to 170°C for hexane (lines 35-37 of column 7). Bagley et al. further disclose that the conversion temperature of a given fuel is a function of at least the aging of a catalyst (lines 31-34 of column 1). Thus, the conversion temperatures of the three different fuels given above by Bagley et al. are not constant values for any catalyst. They are at least a function of the deteriorated condition of the catalyst. As illustrated in Figure 2, one of the more reliable ways to determine this conversion temperature is provided by Bagley et al. By detecting an exotherm or a sharp temperature rise in the catalyst when the catalyst reaches 45°C, Bagley et al. are able to determine that with methanol as a fuel, the conversion temperature for a mixture of air and methanol for the specific catalyst they are testing is at about 45°C. Thus, Bagley et al. clearly disclose the step in dispute.

Re claims 4-20, in response to applicant's argument that Hirota et al. fail to inject a hydrocarbon based on a measured temperature of the catalyst when an exothermic reaction is detected (pages 11 and 13 of Applicant's Amendment), the examiner again respectfully disagrees

As shown in Figure 14 and indicated on lines 28-33 of column 9, Hirota et al. detect a temperature difference or an exotherm ($\Delta t = t2 - t1$) indicating an exothermic reaction across the catalyst (step 608), wherein t1 is a measured temperature of an inlet of the catalyst (6) and t2 is a measured temperature of an output of the catalyst (emphasis added). Also in this step, the temperature of an output of the catalyst (t2) is measured in response to the detected exothermic reaction. Based on the detected exotherm Δt and the measured temperatures t1 and t2, Hirota et al. adjust and inject a hydrocarbon fuel into the catalyst (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10). Thus, Hirota et al. clearly disclose the claimed features of the pending application.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Communication

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tu M. Nguyen

TMN

December 22, 2004

Tu M. Nguyen

Primary Examiner

Art Unit 3748